Report Documenting the Reasonableness of the Conjunctive Use Benefit of Surface Water and Recycled Water to Groundwater Customers

For the

Santa Clara Valley Water District

Final Report

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Prepared By:

RAFTELIS
FINANCIAL CONSULTANTS, INC.

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Executive Summary

In 2010, the Santa Clara Valley Water District (District) engaged Raftelis Financial Consultants, Inc. (RFC) and an engineering team comprised of Carollo Engineers and HydroMetrics Water Resources Inc. to conduct an analysis regarding the conjunctive use benefit of treated water to groundwater (GW) and surface water (SW) users. This analysis is documented in the report dated February 17, 2011 and titled "Report Documenting the Reasonableness of the Conjunctive Use Benefit of Treated Water to Groundwater and Surface Water Customers" (2011 Report). This analysis provided justification for the District's rate setting practices regarding treated water and groundwater and surface water rates in the District's North Zone. To provide similar justification for its rate setting practices in the South Zone, the District engaged RFC in 2014 to determine the conjunctive use benefit of surface water (SW) and recycled water (RW) to groundwater (GW) customers using the same methodology as documented in the 2011 Report. This analysis compared the fixed and operating costs under the existing system to a hypothetical predominately groundwater only system. To estimate the conjunctive use benefit of SW and RW to GW and/or SW users, the existing system in the South Zone was compared to two hypothetical predominately groundwater only systems as follows:

> **Scenario 1:** Assumes surface water users switch to groundwater but recycled water customers continue to receive recycled water
>
> **Scenario 2:** Assumes recycled water users switch to groundwater but surface water users remain on surface water

The fixed and operating costs under the existing system are compared to the fixed and operating costs of the predominately groundwater only system scenarios. The replacement costs of the *existing* facilities (groundwater, surface, and recycled water) are calculated as if the system was built in 2013. The fixed costs to construct a system that would allow the District to replace surface water or recycled water with groundwater are also estimated assuming these assets are constructed in 2013. The operating costs for both the existing system and Scenarios 1 and 2 are also estimated. These costs are annualized and then calculated into perpetuity to represent the life cycle costs of both systems. The ratio between the capital and operating costs into perpetuity under the existing system and under each scenario establish the conjunctive use benefit of surface or recycled water.

In establishing its FY 2015 groundwater rates in the South zone, the District set rates such that the difference between the surface water rate and the groundwater rate is $18.60 to represent costs associated with managing, operating and billing for surface water customers (surface water master charge). This was accomplished by transferring $44,000 from surface water to groundwater users. Using the range of results from comparing the costs for the existing system to those under Scenario 1, the District could have set rates by transferring $54,000 in costs for the conjunctive use benefit of surface water to groundwater customers. Because this analysis indicates the District could have transferred more costs, the District's estimation of the conjunctive use benefit of surface water is reasonable and justified by the results of this analysis. The District's rate setting practices also ensure the effective management of both groundwater and surface

water. Furthermore, a 2014 survey completed by RFC indicates the District's groundwater and surface water rates are within the range of untreated rates assessed by other agencies.

In establishing its FY 2015 groundwater rates in the South zone, the District set rates such that the difference between the recycled water rate and the groundwater rate is $20.00. This was accomplished by transferring $813,000 from recycled water to groundwater users. Using the range of results from comparing the costs for the existing system to those under Scenario 2, the District should have transferred slightly less costs ($794,000) for the conjunctive use benefit of recycled water to groundwater customers. The most the District can transfer to represent the conjunctive use benefit of the RW water system to groundwater and/or surface water users is the amount that would equate the RW rate with the GW rate. However, in practice the District is setting the RW rate below the GW rate to encourage the use of recycled water, which is a typical rate setting practice in the water industry, as evidenced by the American Water Works Association (AWWA) and the Water Environment Federation (WEF) recycled water survey conducted in 1999/2000 and updated in 2007[1]. Survey respondents indicated that they set their recycled water rates based on a market analysis, cost of service analysis, or based on a percentage of the potable water rate (the latter of which was the most prominent method for setting recycled rates). The survey indicated that for those utilities that set rates at a percentage of the potable water rate, the rates for recycled water ranged from 20% to 100% of the potable water rate with 80% being the median. The District's recycled rate is 89% of the surface water rate in the South Zone which is consistent with the survey performed by AWWA/WEF and a regional benchmarking survey of recycled and potable water rates conducted by RFC in 2014 which produced a median recycled rate to potable water rate for all survey participants of 87%.

[1] Water Reuse Rates and Charges 2000 and 2007 Survey Results; American Water Works Association; AWWA Water Reuse Committee; 2008.

Section I: Background

In 2010, the Santa Clara Valley Water District (District) engaged Raftelis Financial Consultants, Inc. (RFC) and an engineering team comprised of Carollo Engineers and HydroMetrics Water Resources Inc. to conduct an analysis regarding the conjunctive use benefit of treated water to groundwater (GW) and surface water (SW) users. This analysis is documented in the report dated February 17, 2011 and titled "Report Documenting the Reasonableness of the Conjunctive Use Benefit of Treated Water to Groundwater and Surface Water Customers" (2011 Report). This analysis provided justification for the District's rate setting practices regarding treated water and groundwater and surface water rates in the District's North Zone. The District would like to determine the conjunctive use benefit of surface water (SW) and recycled water (RW) to groundwater (GW) customers in order to provide further justification of its rate setting practices in the South Zone. To maintain consistency in the approach of estimating the conjunctive use benefit of various water sources to groundwater customers, the District has approached RFC to conduct a subsequent study with the following key objectives:

- Determine the conjunctive use benefit of surface water to groundwater customers in the South Zone
- Determine the conjunctive use benefit of recycled water to groundwater customers in the South Zone.

This report documents the analysis of the two objectives listed above and how the results of the analysis should be incorporated into the District's rate setting process for GW production charges, SW charges, and RW charges in the South Zone for fiscal year (FY) 2016 and beyond.

A. Water Supply in the District

Approximately half of the District's water supply comes from water imported through the Sacramento-San Joaquin Delta. The other half of the District's water supply comes from local surface water and groundwater. Rainfall and runoff captured in 10 reservoirs and imported water from the State Water Project (SWP) and the federal Central Valley Project (CVP) replenish groundwater basins or supply water to the District's three treatment plants. The District also supplies recycled water which is generated from the South County Regional Wastewater Authority. In addition, Santa Clara County's water supplies include non-District managed supplies like water purchased from the City and County of San Francisco through the Hetch Hetchy system, recycled water from the City of San Jose's recycled wastewater facility, and locally owned supplies.

The District sells and manages potable and raw water to retailers (13 in total), 5,000 private well owners, and approximately 100 surface water permittees. The District supplies groundwater, treated water, surface water and recycled water in various combinations. The District is tasked with managing its sources of water supply, such that no one source is depleted. Since imported water is used to recharge the groundwater basin and since recycled water is provided as an alternative water source, the District's customers benefit from the District's efficient management of all water supply sources and the conjunctive use nature of the entire system.

B. Customer Classes and Zones

The District has established two distinct zones of benefit based on the benefit provided from the recharge of groundwater basins and the distribution of imported water within each zone, as allowed by the Santa Clara Valley Water District Act[2]. Zone W-2, or the North Zone, encompasses the Santa Clara Valley groundwater basin north of Metcalf Road. Local rainfall is blended with imported SWP and CVP water purchases before being released to replenish the Santa Clara Valley groundwater basin or sent to one of the District's three treatment plants in the North Zone. Several of the District's retail customers in the North Zone purchase treated water from the plants and pump water from the groundwater basin in order to serve their retail customers. As shown in Exhibit 1, over the past three years approximately 78% of the District's water usage occurred in the North Zone, of which only approximately 0.5% was for surface water use. It should be noted there is no District managed recycled water in the North Zone.

Exhibit 1: Average District's Water Usage for FY 2011 – FY 2013 (In 1,000 AF)

Water Usage	North Zone W-2	South Zone W-5	TOTALS	% of Totals
Treated Water	127	0	**127**	**48.0%**
Groundwater	79	55	**134**	**50.6%**
Surface Water	1	2	**3**	**1.1%**
Recycled Water	0	1	**1**	**0.3%**
TOTALS	**207**	**58**	**265**	**100.0%**
% of Total	**78.2%**	**21.8%**	**100.0%**	

Zone W-5, or the South Zone, is comprised of the Llagas groundwater subbasin and the Coyote Valley portion of the Santa Clara subbasin. The South Zone is supplied water mainly through the groundwater basins. Approximately two-thirds of the groundwater usage is artificially recharged each year by the District using CVP water imported via the San Felipe Division or locally captured rain water diverted by the District to various recharge facilities. Recycled water is also made available in this zone through partnerships with neighboring agencies that have wastewater facilities and are able to produce recycled water. As shown in Exhibit 1, over the past three years approximately 22% of the District's water usage occurred in the South Zone, of which approximately 3% is for surface water use and 1.3% is for recycled water use.

The District first classifies its water customers based on the zone of benefit in which they are located. The District then classifies its customers based on the type of water they purchase from the District, such as:

[2] The Santa Clara Valley Water District Act can be viewed by going to the District's website at the following link: www.valleywater.org

- Treated water customers are located in the North Zone and receive treated water from the District's three treatment plants.
- Groundwater customers in both zones pump groundwater directly from the groundwater basins.
- Surface water customers in both zones receive water from the District's streams or pipelines that have been replenished with local or imported water.
- Recycled water customers in the South Zone receive recycled water that has been obtained from the District through partnerships with neighboring agencies that have wastewater facilities and are able to produce recycled water.

The District also classifies customers as either municipal and industrial (M&I) or agricultural (AG). Agricultural water is defined by Section 26.1 of the District Act to be "water primarily used in the commercial production of agricultural crops or livestock." M&I use relates to all water, other than that used for agricultural purposes, that is sold to retailers (comprised of municipalities or private water companies) that resale their water to retail customers, to well owners who pump groundwater, and to surface water permittees.

C. District's Rate Setting Process

To derive its rates, the District follows a six step rate setting process comprised of the following steps, and as shown in Exhibit 3:

- Step 1: Identify utility pricing objectives and constraints
- Step 2: Identify revenue requirements
- Step 3: Allocate costs to customer classes
- Step 4: Allocate offsets to customer classes
- Step 5: Develop unit costs of service by customer class
- Step 6: Develop unit rates by customer class

Using the steps above, the District's calculated rates for FY 2015 are shown in Exhibit 2 (for M&I customers only).

Exhibit 2: District's FY 2015 M&I Rates

	FY 2015
North Zone W-2	
Groundwater / Basic User Charge	**$747.00**
Treated Water Surcharge – Contract	**$847.00**
Surface Water Charge	**$ 765.60**
South Zone W-5	
Groundwater / Basic User Charge	**$319.00**
Surface Water Charge	**$ 337.60**
Recycled Water	**$299.00**

As shown in Step 6 (line 38) of Exhibit 3, the District makes several adjustments to recognize the conjunctive use benefit that all customers receive from the District's effective management of all of its water sources. The first is a treated water adjustment in the North Zone. To make the treated water adjustment, the District shifts costs from treated water customers to groundwater and surface water customers such that the resulting rate between groundwater and treated water customers in the North Zone, is approximately $100, which represents the point of indifference between customers purchasing groundwater and pumping it or purchasing treated water. The District engaged both RFC and Carollo/HydroMetrics to calculate and quantify the conjunctive use benefit of treated water to groundwater and surface water users, and the benefit of servicing AG users to M&I users, which is documented in the 2011 Report.

The District makes two other adjustments in the South Zone. The first is a surface water adjustment which is made by shifting costs from surface water customers to groundwater customers, such that the resulting SW rate is $18.60 higher than the GW rate to represent costs associated with managing, operating and billing for surface water customers (surface water master charge). (It should be noted, in some years, the District may actually shift costs from GW to SW customers but still maintains the differential for surface water master costs). As shown in row 39 of Exhibit 3, the District is targeting a differential of $18.60, which is achieved by applying a factor of 1.06 to the *average unit cost* in the South Zone ($319) to derive a SW rate of $338 for FY 2015 rates. It should be noted the average unit cost is for municipal and industrial (M&I) customers. The District applies ad valorem property tax revenues to reduce the agriculture (AG) rate below the M&I rate. Therefore the unit costs for M&I customers have been separated out to represent the unit cost in the South Zone. The difference between the SW rate and the SW *unit* cost ($427) represents the conjunctive use benefit of SW that is allocated to groundwater users which was $44,000 in FY 2015.

The second adjustment is a recycled water adjustment which is made by shifting costs from recycled water users to groundwater and/or surface water users. The District is applying a factor of 0.94 to the average unit cost in the South Zone to derive a RW rate of $299 (which is $20 less than the GW rate). The difference between the RW rate and the RW *unit* cost ($1,460) represents the conjunctive use benefit of RW water that is allocated to groundwater and/or surface water users. In FY 2015 the conjunctive use benefit was $813,000.

The adjustments represent the conjunctive use benefit that all customers receive from the District's effective management of all of its water sources. For example, if all South Zone customers shown in Exhibit 1 were to obtain all of their water supply from groundwater in their respective subbasins, then eventually some of the subbasins would be depleted. The District's ability to supply surface and recycled water to some of these customers allows the subbasins to have adequate water supply and, therefore, all customer classes benefit from the conjunctive use nature of the District's system even though they may be buying only one source of water. The remainder of this report calculates and quantifies the conjunctive use benefit of surface and recycled water to groundwater users and discusses the reasonableness of these two adjustments.

Exhibit 3: Districts Rate Setting Process for Establishing FY 2015 GW Production Charges in the South Zone

	FY '15 Projection ($K)	Zone W-2						Zone W-5								
	BASELINE	GW		TW	SW		Total W-2	GW		SW		RW		Total W-5		
		M&I	AG	M&I	M&I	Ag		M&I	AG	M&I	AG	M&I	AG			
1	**Operating Outlays**															
2	Operations/Operating Projects	28,780	189	78,094	865	21	107,950	7,597	5,723	165	423	110	94	14,112		
3	SWP Imported Water Costs	5,574	39	17,250	320	8	23,191	-	-	-	-	-	-	-		
4	Debt Service	4,320	30	16,843	55	1	21,249	-	-	-	-	-	-	-		
5	**Total Operating Outlays**	38,674	258	112,187	1,240	30	152,390	7,597	5,723	165	423	110	94	14,112		
6	Step 2- Identify revenue reqmnts															
7	**Capital & Transfers**															
8	Operating Transfers Out	2,595	18	2,868	41	1	5,524	-	-	-	-	-	-	-		
9	Capital Outlays excl. carryforward	27,263	188	93,309	423	10	121,194	-	-	-	-	-	-	-		
10	**Total Capital & Transfers**	29,858	206	96,177	465	11	126,717	-	-	-	-	-	-	-		
11	**Total Annual Program Costs**	68,532	464	208,365	1,705	41	279,107	7,597	5,723	165	423	110	94	14,112		
12		Step 3 - Allocate costs to customer classes						Step 3 - Allocate costs to customer classes								
13	**Revenue Requirement Offsets**															
14	Capital Cost Recovery	(1,724)	(12)	(1,905)	(27)	(1)	(3,669)	1,395	1,090	22	57	595	510	3,669		
15	Debt Proceeds	(24,723)	(171)	(84,615)	(384)	(9)	(109,902)	-	-	-	-	-	-	-		
16	Inter-governmental Services	(396)	(3)	(437)	(6)	(0)	(842)	(68)	(53)	(1)	(3)	-	-	(124)		
17	SWP and W-1 Property Taxes	(4,906)	(34)	(14,524)	(270)	(7)	(19,740)	(671)	(524)	(10)	(27)	(15)	(13)	(1,260)		
18	South County Deficit/Reserve	(954)	(7)	(1,054)	(15)	(0)	(2,030)	1,081	844	17	44	24	20	2,030		
19	Interest Earnings	(161)	(1)	(178)	(3)	(0)	(343)	-	-	-	-	-	-	-		
20	Inter-zone Interest	14	0	16	0	0	30	(16)	(12)	(0)	(1)	(0)	(0)	(30)		
21	Capital Contributions	(656)	(5)	(725)	(10)	(0)	(1,396)	-	-	-	-	-	-	-		
22	Other	(824)	(6)	(866)	(16)	(0)	(1,712)	(54)	(42)	(0)	(1)	-	-	(97)		
23	Reserve Requirements	10,721	30	37,504	166	2	48,424	-	-	-	-	-	-	-		
24	**Adjusted Revenue Requirement (FY 15)**	**44,924**	**257**	**141,579**	**1,140**	**25**	**187,927**	**9,264**	**7,025**	**192**	**492**	**714**	**612**	**18,300**		
25	**Adjusted Revenue Requirement (FY 12 adj)**	1,924	(78)	(29,814)	(222)	(17)	(28,206)	86	(884)	21	(46)	308	(295)	(810)		
26	**Total Adjusted Revenue Requirement**	**46,849**	**179**	**111,766**	**918**	**9**	**159,720**	**9,350**	**6,141**	**213**	**447**	**1,022**	**317**	**17,490**		
27	Volume (KAF)	94.1	0.7	104.0	1.5	0.0	200.3	32.0	25.0	0.5	1.3	0.7	0.6	60.1		
28																
29	Revenue Requirement per AF	$ 498	$ 275	$ 1,075	$ 612	$ 236		$ 292	$ 246	$ 427	$ 343	$ 1,460	$ 528	**$ 319**		
30		Step 5 - Develop unit costs by customer class						Step 5 - Develop unit costs by customer class								
31	**Adjustments for Agricultural Preservation**															
32	Allocate WU 1% Ad Valorem Prop Tax	0	(167)	-	-	(7)	(174)	-	(4,471)	-	-	-	-	(4,471)		
33	Transfer GF 1% Ad valorem Prop Tax	-	-	-	-	-	-	-	(940)	-	-	-	-	(940)		
34	Transfer WS 1% Ad Valorem Prop Tax	-	-	-	-	-	-	-	(251)	-	(397)	-	(291)	(940)		
35	Revenue Requirement per AF	$ 497.8	$ 19.1	$ 1,075	$ 612	$ 37.7		$ 292	$ 19.1	$ 427	$ 37.7	$ 1,460	$ 42.9			
36	Step 6 - Rate Design															
37	**Adjustments to Facilitate Conjunctive Use**														**1.06**	**SW**
38	Reallocate TW/SW/RW costs	23,446	-	(23,676)	230	-	0	857	-	(44)	-	(813)	-	-	**0.94**	**RW**
39	Charge per AF	$ 747	$ 19.1	$ 847	$ 766	$ 37.7		$ 319	$ 19.1	$ 338	$ 38	$ 299	$ 42.9			

D. Summary of Methodology Used to Calculate Conjunctive Use Benefit of Treated Water to Groundwater and Surface Water Users in 2011 Report

As mentioned previously, RFC was engaged by the District to determine the conjunctive use benefit of treated water to groundwater users which is documented in the 2011 Report. This analysis compared the fixed and operating costs under the existing system to a hypothetical predominately groundwater only system. This approach involved estimating the capital costs and operating costs in 2010 (the year of the analysis), assuming that the District would have built groundwater facilities that would allow groundwater to replace treated water. This also required estimating the capital costs if all the *existing* facilities (treatment, groundwater, surface, and recycled water) were built in 2010 (and the existing operating costs), for comparative purposes. These costs were then annualized and calculated into perpetuity to represent the life cycle costs of both systems. The ratio between the capital and operating costs into perpetuity under the existing system and under the predominantly groundwater only system established the conjunctive use benefit of treated water. The ratios were calculated under various scenarios to establish a range of the conjunctive use benefit of treated water.

It should be noted that the analysis documented in the 2011 Report examined the District's overall water system, making no distinction between the assets and operating costs in the North and South zones for several reasons. The majority of the infrastructure for both zones (with the exclusion of the recycled water system) is integrated. For example, the infrastructure used to obtain CVP and SWP provides replenishment to groundwater in both zones. The amount of surface water use in either zone is a very small portion of the overall District use. The District obtains and supplies recycled water in order to provide an alternative water source to groundwater and surface water customers, especially during times of droughts. Therefore the analysis documented in the 2011 Report used the ***average*** unit cost of the District's **total** system (both North and South zones) to determine the conjunctive use benefit of treated water to groundwater and surface water customers in the North Zone.

Section II: Calculation of Conjunctive Use Benefit of Surface Water and Recycled Water System Assuming a Predominately Groundwater Only System

A. Methodology Used to Calculate Conjunctive Use Benefit of Surface Water and Recycled Water to Groundwater Users

To recognize and approximate the conjunctive use benefit of the District's surface and recycled water to groundwater users, RFC utilized the same methodology as the analysis conducted and reported in the 2011 Report, where the cost to build and operate a predominately groundwater only system was determined and compared to the costs of the existing system. However, the South Zone assets and costs will have to be identified ***separately*** in order to analyze the substitution of surface water and recycled water with groundwater. Because the District sells most of its surface water and recycled water to customers in the South zone, the analysis will focus on the assets used to supply water in the South Zone. While the majority of the infrastructure for both zones (with the exclusion of the recycled water system) is integrated, the infrastructure must be separated by zone in order to establish a baseline of costs for the existing system in the South Zone.

To determine the costs to operate a predominately groundwater only system in the South Zone, District engineering staff reviewed the groundwater system capacity in the South zone and estimated the additional assets and costs needed to replace either SW or RW in the South zone with GW. This included costs such as those related to additional recharge ponds. Two different scenarios were calculated for a predominately groundwater only system which were as follows:

> **Scenario 1:** Assumes surface water users switch to groundwater but recycled water customers continue to receive recycled water
>
> **Scenario 2:** Assumes recycled water users switch to groundwater but surface water users remain on surface water

The costs for each of these scenarios was added to the existing costs to operate the South zone system but excluded costs for the water source that is being replaced by GW. The costs for each of the predominately groundwater system scenarios in the South zone were then compared to the existing costs of the South zone.

The remaining sections of this report explain the methodology used to calculate the ratio between the existing system and each of the predominately groundwater only system scenarios in the South Zone. The analysis calculates ratios using costs in 2013 dollars (the most recent actual data available as of the date of this report) and without any land costs. Because land costs are excluded, the resulting ratios represents conservative data points of the conjunctive use benefit of surface water and recycled water. And the ratios test the reasonableness of the District's rate setting practices in the South Zone.

B. Analysis of Existing System in South Zone

i. Description of Existing System

General Overview

The District's water supply operations in the South Zone include groundwater from the Llagas Subbasin and the Coyote Valley part of the Santa Clara Subbasin, infrastructure to receive imported water from the Central Valley Project, and recycled water from the South County Regional Wastewater Authority (SCRWA).

Groundwater and Surface Water: The groundwater system in the South County is comprised of the Coyote Valley (part of the Santa Clara Subbasin) and Llagas Subbasin to transmit, filter and store water. Water enters the basins through recharge areas and undergoes natural filtration as it is transmitted into deeper aquifers. Groundwater basins are replenished naturally through rainfall and through managed recharge areas. These managed recharge systems include off-stream ponds and local creeks. Runoff is captured in the District's reservoirs (along with imported water from the Northern California watersheds via the Sacramento-San Joaquin Delta) and released to ponds for percolation into the groundwater subbasins. Local rainfall contributes to the local water supply when it is captured, used, or stored by reservoirs and streams, and through infiltration (percolation) into the groundwater basins. Eventually the groundwater reaches pumping zones, where it is extracted for municipal, industrial, and agricultural uses. Through its rigorous groundwater recharge activities, the District works to keep the groundwater basins at operational capacity, banking water locally to protect against drought or emergency outages. In addition to providing water for M&I and AG uses, the groundwater basins have vast storage capacity. Storing surplus water in the groundwater basins enables part of the County's supply to be carried over from wet years to dry years.

Imported Water: Imported water comes to the county from Northern California watersheds via the Sacramento-San Joaquin Delta. This water is delivered by the SWP and the CVP. Imported water is conveyed to Santa Clara County through two main conveyance facilities: the South Bay Aqueduct, which carries SWP water from the South Bay Pumping Plant; and the Santa Clara Conduit and Pacheco Conduit, which bring CVP water from the San Luis Reservoir. Imported water is stored in several of the District's reservoirs and either released to recharge groundwater or transported to the District's 3 treatment plants. For the South County, only CVP water is imported in the South County.

Recycled Water: Recycled water involves the collection of wastewater discharged within the county, treating and purifying the water to the standards set forth by the State Water Resources Control Board, and using the recycled water for non-potable uses in lieu of potable supplies. Recycled water is a local

water source developed by Santa Clara County's four wastewater treatment plants: San Jose/Santa Clara Water Pollution Control Plant, SCRWA, Sunnyvale Water Pollution Control Plant, and the Palo Alto Regional Water Quality Control Plant. The District works with the wastewater authorities in the county on partnerships to promote water recycling for non-potable uses such as irrigation and industrial uses. In south Santa Clara County, the District is the recycled water wholesaler/retailer and is responsible for the recycled water distribution system.

ii. O&M Costs of Existing System in South Zone

O&M costs include each item in the District's budget such as purchased water, chemicals, treatment, general and administrative costs necessary to manage the District's water system, as well as other operating costs. The District first classifies each line item in the O&M budget by function[3], as follows:

- Source of Supply – Costs that relate to obtaining water supply sources.
- Raw Water Transmission and Distribution (T&D) – Costs that relate to the transmission of water supply sources to the District.
- Treatment Plant – Costs that relate to the treatment of water at the District's three treatment plants.
- Treated Water Transmission and Distribution – Costs that relate to distributing water from the treatment plants to the District's wholesale customers.
- General & Administration - Costs, as discussed previously, that relate to direct water utility management and administration costs, such as division management, billing, training and data maintenance.

Because treated water is only provided in the North Zone, O&M costs classified as treatment plant and treated water transmission and distribution are excluded from the analysis for the South Zone. Therefore only the highlighted functions above (Source of Supply, Raw Water Transmission and Distribution, and General & Administration Costs) are included in the analysis for the South Zone.

Then the District determines if each line item relates to operations in the North Zone or South Zone. District staff reviews each line item and allocates costs between the two zones based on the benefits received by each zone. The District then uses the functional categories to further identify costs by system. For example, some costs relate to groundwater operations only (GW), to the recycled water system operations (RW), to treatment operations (TW), etc. Exhibit 4 shows the District's actual O&M costs for

[3] The District's costs for each function also include overhead, or indirect general fund services which relate to shared administrative services for both the Water Utility and Watersheds, such as Finance, Human Resources, etc.

the South Zone for the past 3 years, the actual AF sold, and the annual percent change in O&M costs. The total O&M costs for the existing South Zone are approximately **$12.4 million.**

It should be noted the O&M costs in Exhibit 4 do not represent costs associated with annual debt service payments or costs associated with capital projects funded through groundwater production charges or reserve funds, with the exception of the costs noted in footnote 2. As mentioned in footnote 2, capitalized costs were added for the San Felipe Division because the majority of the infrastructure for this asset is owned by the USBR and is therefore not reflected in the District's fixed asset data or in the fixed asset analysis explained later in this report. The District performs maintenance on a portion of this asset each year. To ensure these costs are captured, they have been added to the O&M costs for each scenario (in equal value). Also, it should be noted the O&M expenses show actual costs through FY 2013 because actual FY 2014 costs were not available as of the writing of this report. The historical O&M costs are used to calculate the 3-year annual percentage change in the existing system O&M costs for the South Zone that will later be used in Exhibit 11.

Exhibit 4: History of Actual O&M Expenses for Existing System in the South Zone

EXISTING SYSTEM - South Zone

South Zone	FY 2011	FY 2012	FY 2013	3-year average
Actual O&M Costs (1)				
GW	$ 10,326,000	$ 10,950,000	$ 11,709,000	***$ 10,995,000***
SW -all other (2)	$ 336,285	$ 351,995	$ 442,947	***$ 377,076***
SW -master costs (2)	$ 47,715	$ 87,005	$ 28,053	***$ 54,258***
RW	$ 79,000	$ 81,000	$ 120,000	***$ 93,333***
Subtotal: Actual O&M Costs in South Zone	$ 10,789,000	$ 11,470,000	***$ 12,300,000***	$ 11,519,667
% Change		*6.3%*	*7.2%*	***6.8%***
Plus: Capitalized Costs for San Felipe (3)			***$ 95,640***	
Total Actual O&M Costs in South Zone			***$ 12,395,640***	
Total Actual Use in South Zone (AF)	55,051	56,394	58,995	56,813
% Change		*2.4%*	*4.6%*	***3.5%***

(1) Allocation of O&M costs to the South Zone between GW, SW, and RW was obtained from the District's cost of service model.
(2) The O&M costs for the surface water system have been separated between surface water master costs and all other O&M costs.
(3) The San Felipe Division was built by the USBR in 1987 and is not an asset of the District. However, the District performs annual maintenance on a portion of this asset each year. These costs are not O&M expenses but annual capital outlay. Because the San Felipe Division is not an asset of the District, it is not on the District's asset list and is not represented in the fixed asset portion of this analysis. Therefore this is the only capital outlay included in O&M, while the rest of capital outlay is represented in the fixed asset portion of the analysis.

iii. Fixed Assets of Existing System in South Zone

The District provided a detailed list of its fixed assets, which included the original cost of each asset, the useful life of each asset and the year the asset was placed in service. Each asset was categorized by function, similar to that used for categorizing O&M Costs: source of supply, raw water T&D, water treatment, treated water T&D, and general and administrative. Assets were further classified by system as follows:

- CVP – assets used to obtain Central Valley Project Water
- GST – assets used to provide groundwater, surface water and treated water jointly
- GW – assets used to provide groundwater
- T – assets used to provide treated water
- RW – assets used to provide recycled water

To identify those assets in the South Zone, District staff reviewed each asset in the fixed assets records as of 2013 and determined the portion of each asset that related to the South Zone.

To determine the 2013 costs, or replacement cost of each asset, the Handy-Whitman Index of Public Utility Construction Costs[4] was used (Refer to Appendix A). This source provides indices for water utility construction costs by region. Specifically, indices for the Pacific region were used to escalate the original costs to 2013 dollars.

For each of the District's assets in the South Zone, the appropriate index was used, depending on the year each asset was placed in service, to determine the cost of constructing those assets in 2013 (since 2013 O&M costs was the most recent actual data available, the same time period was used for determining fixed costs) . The sum of these costs represent the replacement costs, or the costs required today to re-construct (or replace) the District's existing groundwater, surface water and recycled water system in 2013 in the South Zone. Exhibit 5 shows the summary of the original cost and the replacement cost for the South Zone by function and by system. The categorization by function was used to also reclassify the assets by system, as explained previously. As shown in Exhibit 5, the original costs of the fixed assets in the existing system in the South Zone are approximately $48 million and the escalated costs (replacement costs) in 2013 dollars are approximately **$184 million.**

[4] Handy-Whitman Index of Public Utility Construction Costs, Trends of Construction Costs, Bulletin No. 172; 1912 to July 1, 2010.

Exhibit 5: Existing System Original and Escalated Fixed Asset Costs for South Zone

Summary - EXISTING SYSTEM

System	Sum of Original Cost	Sum of Replacement Cost
CVP	$ 542,424	$ 678,267
GST	$ 21,412,821	$ 135,793,295
GW	$ 8,164,221	$ 25,268,788
T (1)	$ 227,580	$ 297,994
RW	$ 17,835,352	$ 21,914,762
TOTAL	**$ 48,182,398**	**$ 183,953,105**

(1) The only treatment assets reflected are associated with the lab that performs testing for water quality, and only a portion of the lab assets have been allocated to the South Zone.

C. Predominately Groundwater Only Systems in the South Zone

The capital and operating costs of the existing system in the South Zone must be compared to the capital costs and operating costs under a predominately groundwater only system in the South Zone. However, two scenarios for the predominately groundwater only system have to be considered. Scenario 1 assumes that the District replaces surface water infrastructure with groundwater infrastructure but all recycled water assets remain as they are. Scenario 2 assumes the District replaces recycled water with groundwater infrastructure but all surface water assets remain as they are. This requires the identification of the infrastructure required to replace either surface water or recycled water with groundwater, and then estimating the capital and operating costs of these two systems in 2013 dollars.

i. Description of Predominately Groundwater Only Systems

General Overview of Predominately Groundwater Only System – Scenario 1

District engineering staff utilized a model to analyze risks of water supply shortage if the District abandoned its surface water infrastructure and instead supplied groundwater to all surface water customers in the South Zone. The detailed analysis that District staff conducted is shown in Appendix C, and is summarized below. Because the entire surface water infrastructure is related to assets used to import water and/or replenish groundwater, District staff determined that all surface water infrastructures would still have to exist regardless if surface water customers in the South Zone received surface water or groundwater. Therefore the assets identified in Exhibit 5 are the basis for the infrastructure needed if surface water customers in the South Zone switched to groundwater. However, District staff utilized the model to determine the capacity of the existing groundwater system in the South Zone and the additional infrastructure required to supply groundwater to all surface water customers in

the South Zone. District staff assumed that historic surface water usage was replaced with groundwater pumping. District staff then used the model to identify facilities that could meet demand without violating District operational policies or physical constraints, such as subsidence thresholds and flooding. The scenario identified by District staff that would meet water demand without resulting in subsidence or excess flooding includes:

1. 8.4 acres of additional recharge pond area would be needed if surface water deliveries were not available in South County
2. Locating new groundwater pumping and spreading the additional groundwater pumping among new extraction wells. *It is assumed that the SW customers would be responsible for drilling these wells so no additional costs for drilling or pumping wells is included in this Scenario since these costs would be incurred by the SW customers and not the District*.

General Overview of Predominately Groundwater Only System – Scenario 2

District engineering staff utilized the same model to analyze risks of water supply shortage if the District abandoned its recycled water infrastructure and instead supplied groundwater to all recycled water customers in the South Zone. District staff assumed that historic recycled water usage was replaced with groundwater pumping. District staff then used the model to identify facilities that could meet demand without violating District operational policies or physical constraints, such as subsidence thresholds and flooding. The most viable scenario includes:

1. 4.2 acres of additional recharge pond area would be needed if recycled water deliveries were not available in South County
2. Locating new groundwater pumping and spreading the additional groundwater pumping among new extraction wells. *It is assumed that the RW customers would be responsible for drilling these wells so no additional costs for drilling or pumping wells is included in this Scenario since these costs would be incurred by the RW customers and not the District*.

ii. O&M Costs of Predominately Groundwater Only System Scenarios

In order to determine the O&M costs of the two predominately groundwater only systems, the District's existing O&M costs were used and then modified. As mentioned previously, the District categorizes O&M costs by function[5] and then by system. These costs were used, plus those additional costs estimated to facilitate the replacement of either surface water or recycled water with groundwater as explained below.

[5] The District's costs for each function also include overhead, or indirect general fund services which relate to shared administrative services for both the Water Utility and Watersheds, such as Finance, Human Resources, etc.

O&M Cost for Predominately Groundwater Only System – Scenario 1

Scenario 1 assumes that surface water in the South Zone is replaced with groundwater. However, as mentioned previously, the surface water infrastructure that is used to import water for either surface water distribution or recharging groundwater would still be required. As a result, District staff determined that all existing surface water O&M costs would still exist under this Scenario with the exception of costs associated with billing and operating surface water turnouts for permittees. In addition, to facilitate the replacement of surface water with groundwater would require 8.4 acres of additional recharge pond area, which would produce additional O&M costs. Additional recharge costs are estimated by taking the average actual recharge costs over the past three years in all 3 basins and applying the average to the additional acre feet to be recharged (SW usage will now be GW that is pumped). As mentioned previously, the capital costs to maintain a portion of the San Felipe Division are also included in the O&M expenses. The total O&M costs for Scenario 1 are approximately **$12.5 million,** as shown in Exhibit 6.

Exhibit 6: Predominately Groundwater Only System O&M Costs – Scenario 1

Scenario 1: PREDOMINATELY GW ONLY SYSTEM - South Zone: Assume SW customers use GW but RW customers remain on RW

Existing O&M Costs *LESS* SW Master Costs (1)	**FY 2011**	**FY 2012**	**FY 2013**	**3-year average**
GW	$ 10,326,000	$ 10,950,000	$ 11,709,000	*$ 10,995,000*
SW -all other (2)	$ 336,285	$ 351,995	$ 442,947	*$ 377,076*
RW (3)	$ 79,000	$ 81,000	$ 120,000	*$ 93,333*
Subtotal: Existing O&M Costs	$ 10,741,285	$ 11,382,995	**$ 12,271,947**	*$ 11,465,409*
% Change		*6.0%*	*7.8%*	***6.9%***
Plus: Capitalized Costs for San Felipe (4)			**$ 95,625**	

PLUS: Additional O&M Costs required to facilitate SW customers switching to GW

A) Additional recharge costs:

Calculated recharge cost per AF based on 3-year average (5)		***$ 43.89***
Acre feet to be recharged (6)	2,035	
Subtotal: Additional recharge costs to be incurred (using 3-yr avg cost)	**$ 89,312**	
Total Estimated O&M Costs in South Zone - Scenario 1	***$ 12,456,884***	

(1) Allocation of O&M costs to the South Zone between GW, SW, and RW was obtained from the District's cost of service model.
(2) The SW assets would still be required for a predominately GW only system and therefore the majority of the SW O&M costs would continue to be incurred. However, SW customers would switch to GW which would eliminate the water master costs.
(3) In this scenario, the RW customers would remain as RW customers and would not switch to GW.
(4) The San Felipe Division was built by the USBR in 1987 and is not an asset of the District. However, the District performs annual maintenance on a portion of this asset each year. These costs are not O&M expenses but annual capital outlay. Because the San Felipe Division is not an asset of the District, it is not on the District's asset list and is not represented in the fixed asset portion of this analysis. Therefore this is the only capital outlay included in O&M, while the rest of capital outlay is represented in the fixed asset portion of the analysis.
(5) Recharge costs are estimated by taking the actual recharge costs over the past three years and the actual recharge volume in all 3 basins over the past 3 years, as shown below in Note A.
(6) In this scenario, SW customers switch to GW and therefore the SW actual sales are assumed to be pumped from GW.

Note A: Calculation of additional recharge costs	**FY 2011**	**FY 2012**	**FY 2013**	**3-year average**
recharge Fac Asset Mgt	$ 177,718	$ 192,549	$ 213,591	*$ 194,619*
Rchrg Ops Pln Anl	$ 196,854	$ 239,371	$ 250,482	*$ 228,902*
Recharge field ops	$ 1,719,440	$ 2,633,849	$ 2,534,458	*$ 2,295,916*
Recharge Fac Maint	$ 1,768,237	$ 1,304,990	$ 1,375,721	*$ 1,482,983*
Recharge cost ($s)	$ 3,862,249	$ 4,370,759	**$ 4,374,252**	*$ 4,202,420*
Recharge volume (AF) of all 3 basins	**94,180**	**96,730**	**96,350**	***95,753***
Cost per AF	$ 41.01	$ 45.19	$ 45.40	**$ 43.89**

Scenario 2 assumes that only recycled water in the South Zone is replaced with groundwater. Therefore the surface water infrastructure that is used to import water for either surface water or recharging groundwater would still be required, but the recycled water assets would not be required. As a result, District staff determined that all existing surface water O&M costs would still exist under this scenario but that RW O&M costs would not exist under this scenario. In addition, to facilitate the replacement of recycled water with groundwater would require 4.2 acres of additional recharge pond area, which would produce additional O&M costs. Additional recharge costs and San Felipe Division costs are determined based on the methodology explained in Scenario 1. There is one additional O&M cost that has been

factored into Scenario 2. Recycled water is a water supply source that is not impacted by drought conditions since this source is treated wastewater effluent. If RW is no longer available, the District will have to replace this water supply with water purchased on the spot market. The O&M costs associated with replacing RW on the spot market are included in Scenario 2 but are assumed to only take place 20% of the time, which is consistent with the probability of drought occurring in the District's service area based on hydrology records dating back to 1906. The total O&M costs for Scenario 2 are approximately **$12.4 million,** as shown in Exhibit 7**.**

Exhibit 7: O&M Cost for Predominately Groundwater Only System – Scenario 2

Scenario 2: PREDOMINATELY GW ONLY SYSTEM - South Zone: Assume SW customers remain on SW but RW customers switch to GW

Existing O&M Costs *LESS* RW Costs (1)	**FY 2011**	**FY 2012**	**FY 2013**	**3-year average**
GW	$ 10,326,000	$ 10,950,000	$ 11,709,000	*$ 10,995,000*
SW -all other (2)	$ 336,285	$ 351,995	$ 442,947	$ 377,076
SW -master costs (2)	$ 47,715	$ 87,005	$ 28,053	$ 54,258
RW (3)	$ -	$ -	$ -	$ -
Subtotal: Existing O&M Costs	$ 10,710,000	$ 11,389,000	**$ 12,180,000**	*$ 11,426,333*
% Change		*6.3%*	*6.9%*	***6.6%***

Plus: Capitalized Costs for San Felipe (4)	**$ 95,625**	

PLUS: Additional O&M Costs required to facilitate RW customers switching to GW

A) Additional recharge costs:		
Calculated recharge cost per AF based on 3-year average (5)		***$ 43.89***
Acre feet to be recharged (6)	960	
Subtotal: Additional recharge costs to be incurred (using 3-yr avg cost)	**$ 42,148**	
B) Costs to replace RW supply that is drought resistant (7)		
Cost to buy water on spot market per AF (3-yer average) (8)		**$ 601**
Recycled water sales (AF)	960	
Probability of drought occurring (9)		20%
Subtotal: Costs to replace RW supply during drought conditions	**$ 115,397**	
Total Estimated O&M Costs in South Zone - Scenario 2	***$ 12,433,170***	

(1) Allocation of O&M costs to the South Zone between GW, SW, and RW was obtained from the District's cost of service model.
(2) The SW assets would still be required for a predominately GW only system and therefore the SW O&M costs would continue to be incurred. Since SW customers would continue to receive SW, the surface water master costs would also be incurred.
(3) In this scenario, the RW customers would switch to GW so recycled water O&M costs would not be incurred.
(4) The San Felipe Division was built by the USBR in 1987 and is not an asset of the District. However, the District performs annual maintenance on a portion of this asset each year. These costs are not O&M expenses but annual capital outlay. Because the San Felipe Division is not an asset of the District, it is not on the District's asset list and is not represented in the fixed asset portion of this analysis. Therefore this is the only capital outlay included in O&M, while the rest of capital outlay is represented in the fixed asset portion of the analysis.
(5) Recharge costs are estimated by taking the actual recharge costs over the past three years and the actual recharge volume in all 3 basins over the past 3 years. The calculation is explained in Note A below.
(6) In this scenario, RW customers switch to GW and therefore the RW actual sales are assumed to be pumped from GW.
(7) Recycled water is a water source that is drought resistant, unlike CVP water. Therefore we have to include costs to replace this water source in the event of a drought.
(8) Assume replacement of recycled water is at the cost of water bought on the spot market. The spot market cost per AF represents the weighted average cost of spot market rates during both normal and drought conditions as shown in Note B.
(9) The probability of a drought occurring is based on hydrology information starting from the year 1906 that has been kept by District staff.

Note A: Calculation of additional recharge costs	**FY 2011**	**FY 2012**	**FY 2013**	**3-year average**
recharge Fac Asset Mgt	$ 177,718	$ 192,549	$ 213,591	*$ 194,619*
Rchrg Ops Pln Anl	$ 196,854	$ 239,371	$ 250,482	*$ 228,902*
Recharge field ops	$ 1,719,440	$ 2,633,849	$ 2,534,458	*$ 2,295,916*
Recharge Fac Maint	$ 1,768,237	$ 1,304,990	$ 1,375,721	*$ 1,482,983*
Recharge cost ($s)	$ 3,862,249	$ 4,370,759	**$ 4,374,252**	*$ 4,202,420*
Recharge volume (AF) of all 3 basins	**94,180**	**96,730**	**96,350**	***95,753***
Cost per AF	$ 41.01	$ 45.19	$ 45.40	**$ 43.89**

Note B: Estimate of Weighted Average Spot Market Cost	Sport Market Cost per AF	Probability of Drought	Weighted Average Spot Market Cost
District's Average Spot market costs under normal conditions	$ 376	80%	$ 301
District's Estimated Avg. Spot market costs under drought conditions	$ 1,500	20%	$ 300
Estimated weighted average spot market cost per AF			**$ 601**

iii. Fixed Assets for Predominately Groundwater Only Systems

The next step was to determine the costs of the infrastructure necessary to supply groundwater required if SW or RW was not available and instead supplied by groundwater infrastructure only. To estimate the infrastructure needed for Scenario 1 and 2, the District's fixed asset information was used as a starting point. As mentioned previously, the fixed asset data is categorized by system. For example, some assets relate to groundwater only, to the recycled water system, specifically to imported water from the Central Valley Project (CVP), etc. It should be noted there are only minimal costs for assets associated with CVP because the majority of the infrastructure constructed for the delivery of CVP water was funded by the federal government.

Development of Fixed Assets for Scenario 1

Exhibit 8 shows the calculation of the fixed costs required for Scenario 1. As shown in Exhibit 8, for Scenario 1, the existing assets would still be required since all existing surface water infrastructure would be needed to replenish groundwater. Therefore the assets for Scenario 1 are the same as under the existing system. The total existing system assets that are to be included in Scenario 1 total approximately $48 million, but these represent the original cost to construct these assets and represent costs at the time the assets were placed in service. Similar to the method explained in Section II (B) (iii), we apply Handy Whitman indices to determine the replacement cost in 2013 dollars, which is approximately $184 million.

In addition to the replacement costs of $184 million for the existing system assets that would still be used for Scenario 1, the new assets that are needed to facilitate additional groundwater must be included. These assets include the costs to construct 8.4 acres of new recharge areas. These new assets total approximately $2.9 million. These costs were estimated by using the cost of recharge/percolation pond construction at $316,000 per acre in 2010 dollars that was estimated by Corollo Engineers in the 2011 Report. To determine the cost in 2013 dollars, the Handy Whitman construction cost index was used. The total costs of the predominately groundwater only alternative for Scenario 1 are approximately **$187 million**.

It should be noted that the $187 million does <u>not</u> reflect any costs associated with land that would have to be purchased for the new recharge areas. Because of the numerous assumptions regarding the value of land, these costs were excluded from the initial analysis. The costs for the predominately groundwater only system also exclude any costs to provide the level of reliability provided by the existing conjunctive use system and to ensure that all regulatory standards are addressed. The exclusion of these costs indicates that the costs for the predominately groundwater only system under both Scenario 1 (and Scenario 2) are very conservative.

Exhibit 8: Fixed Costs of Scenario 1 (Exclusive of land costs)

Scenario 1:

Existing	Sum of Original Cost	Sum of Replacement Cost
CVP	$ 542,424	$ 678,267
GST	$ 21,412,821	$ 135,793,295
GW	$ 8,164,221	$ 25,268,788
T	$ 227,580	$ 297,994
RW	$ 17,835,352	$ 21,914,762
TOTAL	**$ 48,182,398**	**$ 183,953,105**

ADD: Additional facilities needed			Asset life
Recharge ponds			
District's estimate of number of acres of recharge ponds		8.4	100
2010 Carollo Engineers Estimate per acre	$	316,000	
Escalate to 2014 Dollars			
Handy Whitman construction cost index for 2010		445	
Handy Whitman construction cost index for 2013		478	
Escalation Factor		107%	
2013 Carollo Engineers Estimate per acre	$	339,434	
Cost of Recharge ponds	**$**	**2,851,243**	
TOTAL Predominately Groundwater only system assets for Scenario 1	**$**	**186,804,348**	

Development of Fixed Assets for Scenario 2

Exhibit 9 shows the fixed assets developed for Scenario 2. For Scenario 2, the recycled water assets would not have been constructed but instead infrastructure would be required to provide groundwater to these recycled water customers. Therefore the assets for Scenario 2 are the same as under the Existing System but exclude the recycled water assets. The total of the existing system assets that are to be included in Scenario 2 total approximately $30.3 million, but these represent the original cost to construct these assets and represent costs at the time the assets were placed in service. Similar to the method explained in Section II (B) (iii), we apply Handy Whitman indices to determine the replacement cost in 2013 dollars, which is approximately $162 million.

In addition to the replacement costs of $162 million for the existing system assets that would still be used for Scenario 2, the new assets that are needed to facilitate additional groundwater must be included. These assets include the costs to construct 4.2 acres of new recharge areas. These new assets total approximately $1.4 million. These costs were estimated using the same methodology as explained in Scenario 1. The total costs of the predominately groundwater only alternative are approximately **$163.5**

million. Similar to Scenario 1, the $163.5 million does not reflect any costs associated with land that would have to be purchased for the new recharge areas or costs to provide the level of reliability provided by the existing conjunctive use system and to ensure that all regulatory standards are addressed.

Exhibit 9: Fixed Costs of Scenario 2 (Exclusive of land costs)

Scenario 2:				
Existing		**Sum of SC $**		**Sum of Replacement Cost**
CVP	$	542,424	$	678,267
GST	$	21,412,821	$	135,793,295
GW	$	8,164,221	$	25,268,788
T	$	227,580	$	297,994
RW	$	17,835,352	$	21,914,762
Subtotal	**$**	**48,182,398**	**$**	**183,953,105**
***LESS:* RW**	**$**	**(17,835,352)**	**$**	**(21,914,762)**
NET Fixed Assets	**$**	**30,347,046**	**$**	**162,038,343**

			Asset life
ADD: Additional facilities needed			
Recharge ponds			
District's estimate of number of acres of recharge ponds		4.2	100
2010 Carollo Engineers Estimate per acre	$	316,000	
Escalate to 2014 Dollars			
Handy Whitman construction cost index for 2010		445	
Handy Whitman construction cost index for 2013		478	
Escalation Factor		107%	
2013 Carollo Engineers Estimate per acre	$	339,434	
Cost of Recharge ponds	**$**	**1,425,622**	
TOTAL Predominately Groundwater only system assets for Scenario 2	**$**	**163,463,964**	

D. Calculation of Conjunctive Use Benefit of Surface Water and Recycled Water

To calculate the conjunctive use benefit of surface water and recycled water and to test the reasonableness of the District's rate setting practices in the South Zone, the existing O&M and fixed assets costs are compared to the O&M and fixed assets costs for the predominately groundwater only systems. The predominately groundwater only system for Scenario 1 represents the costs the District would have incurred had it built additional infrastructure to provide groundwater to surface water customers, and the predominately groundwater only system for Scenario 2 represents the costs had the District not built recycled water facilities but instead built groundwater facilities. If the District had pursued these scenarios, all customers would pay the same rate for water since there would no longer be a distinction between surface water, recycled water, and groundwater in the South Zone. The ratio between the existing system costs and the predominately groundwater only system costs for each scenario provides

an estimation of the conjunctive use benefit of surface water and recycled water. The ratios allow us to estimate the surface water and recycled water costs that should be shared by all customers due to the conjunctive use nature of the system.

To compare the existing system costs to the costs under both the predominately groundwater only scenarios, costs are annualized, as shown in Exhibit 11. The average O&M costs for FY 2013 from Exhibits 4, 6 and 7 are carried forward. These costs are used since they represent the most current year for which actual O&M costs can be obtained. Then these costs are escalated by the average annual change in O&M costs for each scenario.

To annualize the replacement costs for each scenario, the total replacement costs are divided by the weighted average service life of the system. For the existing system, the weighted average service life is 69.07 years. For Scenarios 1 and 2, the weighted average service life is 69.54 years and 70.49 years, respectively. The weighted average service life of the predominately groundwater only scenarios are slightly higher due to the recharge ponds having a service life of 100 years, whereas many of the existing system assets have a service life of 50 to 80 years. The annualized replacement cost represents the annual cost to purchase the system in 2013.

In performing the cost comparison of each scenario it is important to select a cost stream that is representative of the typical cost stream in the future, which is referred to as a "normalized year". This normalized year is used to calculate the "terminal value", which is used to estimate the costs for the normalized year into perpetuity. The object of the normalized year is to project one year of costs that would be representative of the system into perpetuity meaning over the lifetime of the system. The terminal value is calculated by dividing the annual costs by the capitalization rate, which is the weighted average cost of capital ("WACC") less the growth rate. Exhibit 10 shows the calculation of the WACC, which is comprised of the following components:

i. Cost of Equity:

Risk free rate

\+ <u>Return on Risk Associated with Investing in the District</u>

= Cost of equity

Where:

<u>Cost of Debt:</u> Represents the weighted average cost of all outstanding debt issued by the Santa Clara Valley Water District.

<u>Risk Free Rate:</u> The risk free rate can be determined by looking at the yield on long-term U.S. treasury bonds.

Return on Risk Associated with Investing in the District: The return on risk associated with investing in equity ("equity risk premium") can be determined by comparing the return on equity investments versus the risk free rate. This analysis is performed by Ibbotson Associates each year. However, the risk associated with investing in publicly traded water companies is less than the risk associated with the general stock market. Therefore, the risk associated with investing in equity is multiplied by the average beta of publicly traded water companies to adjust the risk downward.

The long-term sustainable growth rate is then subtracted from the WACC, which is also shown in Exhibit 10. The long-term sustainable growth rate represents the annual growth in the system into perpetuity. This factor was obtained from the Livingston Report dated December 31, 2013 and represents the annual projected growth in GDP for the next 10 years.

Exhibit 10: Calculation of Weighted Average Cost of Capital

Calculation of Capitalization Rate

COST OF DEBT CAPITAL		
Rate on Utility Bonds (1)		**4.67%**
COST OF EQUITY CAPITAL		
Risk Free Rate - Long-Term U.S. Treasury Bond Yield (2)		2.41%
Equity Risk Premium (2)	6.11%	
Beta for Water Companies (3)	0.80	
Adjusted Equity Risk Premium		4.89%
Total Buildup of Cost of Equity Capital		7.30%
DEBT STRUCTURE (4)		
Debt as Percentage of Capital		27.0%
Equity as Percentage of Capital		73.0%
WEIGHTED AVERAGE COST OF CAPITAL (WACC)		
Weighted Cost of Debt		1.26%
Weighted Cost of Equity		5.33%
Weighted Average Cost of Capital		**6.59%**
DISCOUNT AND CAPITALIZATION RATES		
Net Cash Flow Discount Rate (Equal to WACC)		6.59%
Less: Long-Term Sustainable Growth Rate (5)		2.55%
Net Cash Flow Capitalization Rate		**4.04%**

(1) Represents the weighted average cost of all outstanding debt issued by the Santa Clara Valley Water District.
(2) Key Variables in Estimating the Cost of Capital, SBBI Valuation Edition 2013 Yearbook (based on 2012 data).
(3) Median beta for the 8 publicly traded water companies reported by Valueline.
(4) Calculated based on the long-term debt and net assets (or equity) as reported in the fiscal year 2013 Santa Clara Valley Water District Comprehensive Annual Financial Report, page 45.
(5) Based on the Livingston Report dated December 31, 2013 and represents the annual projected growth in GDP for the next 10 years. Source: http://www.philadelphiafed.org/research-and-data/real-time-center/livingston-survey/2013/livdec13.pdf

The terminal value of each scenario is then calculated by dividing the annual costs by the capitalization rate of 4.04%. As shown in Exhibit 11, the terminal value of the existing system is $393.5 million and the terminal value for the predominately groundwater only Scenario 1 and 2 is approximately $396 million and $385.6 million, respectively. The ratio of the terminal value of the existing system to the terminal value for Scenario 1 is **0.994.** A ratio slightly less than 1 indicates that the existing system costs less to build and operate over the lifetime of the system than if additional infrastructure is required to provide groundwater facilities. This result is reasonable because surface water customers can currently access water directly from streams and other existing surface water infrastructure that would still be required even if the system was a GW only system. But in order for these SW customers to switch to groundwater, additional GW infrastructure would be required to serve them which makes the existing system slightly less expensive than a predominately GW only system. The opposite is true for Scenario 2. The ratio of

the terminal value of the existing system to the terminal value for the Scenario 2 is **1.021.** A ratio more than 1 indicates that the existing system is more expensive to build and operate over the lifetime of the system than a predominately GW only system. This result is also reasonable because recycled water is a more expensive water source to obtain on a per unit basis. This is due to recycled water systems having a more limited water supply compared to other water supply system. Since there is less water provided by a recycled system, the unit cost is higher.

Exhibit 11: Comparison of Existing System Costs to Costs for Scenarios 1 and 2 Using 2013 Costs but Excluding Land Costs

Calculation of NPV of Systems

Existing South Zone Annual Costs	Actual Costs FY 2013	6.8% Normalized (1)
Annual Net O&M (based on Actual 2013 Costs)	$ 12,395,625	13,235,320
Depreciation Component (3)	$ 2,663,346	$ 2,663,346
69.07 Weighted Average Service Life		
Total Annual Costs	$ 15,058,970	$ 15,898,666
Terminal Value (at WACC less growth rate) (4)		**$ 393,531,325**

Scenario 1: Predominantly Groundwater Only South Zone System Annual Costs - SW customers switch to GW but RW customers stay on RW

	Estimated Actual Costs FY 2013	6.9% Normalized (2)
Annual Net O&M (based on Actual 2013 Costs)	$12,456,884	$ 13,315,394
Depreciation Component (3)	$ 2,686,265	$ 2,686,265
69.54 Weighted Average Service Life		
Total Annual Costs	$ 15,143,149	$ 16,001,659
Terminal Value (at WACC less growth rate) (4)		**$ 396,080,675**

Ratio of Terminal Value of Existing System to Terminal Value of Scenario 1 0.994

Scenario 2: Predominantly Groundwater Only South Zone System Annual Costs - SW customers remain on SW but RW customers switch to GW

	Estimated Actual Costs FY 2013	6.6% Normalized (3)
Annual Net O&M (based on Actual 2013 Costs) (2)	$12,433,170	$ 13,259,053
Depreciation Component (3)	$ 2,319,042	$ 2,319,042
70.49 Weighted Average Service Life		
Total Annual Costs	$ 14,752,212	$ 15,578,095
Terminal Value (at WACC less growth rate) (4)		**$ 385,596,422**

Ratio of Terminal Value of Existing System to Terminal Value of Scenario 2 1.021

(1) Normalized O&M Costs are calculated by escalating the actual O&M costs in FY 2013 from by the 3-year average increase in annual O&M expenses of 6.8%, as shown in Exhibit 4.

(2) Normalized O&M Costs are calculated by escalating the actual O&M costs in FY 2013 from by the 3-year average increase in annual O&M expenses of 6.9%, as shown in Exhibit 6.

(3) Normalized O&M Costs are calculated by escalating the estimated O&M costs in FY 2013 from by the 3-year average increase in annual O&M expenses of 6.6%, as shown in Exhibit 7.

(3) The depreciation component is calculated by dividing the total replacement costs for each system by the weighted average service life for each system. The total replacement cost for each scenario is provided in Exhibits 5, 8 and 9.

(4) The terminal value is calculated by the dividing the total annual costs by the capitalization rate shown in Exhibit 10.

E. Application to the District's Rate Setting Process

As mentioned in Section I, the District follows a six-step rate setting process. In Step 6, the District makes several adjustments by shifting costs, such as:

- from surface water customers to groundwater customers (or from groundwater customer to surface water customers) such that the resulting rate between groundwater and surface water customers in the South, is approximately $18.60 higher (than GW rates), representing the water master costs
- from recycled water customers to groundwater and/or surface water customers such that the resulting rate between groundwater and recycled water customers in the South is approximately $20 less (than GW rates)

We can apply the results of the analyses to the District's rate setting process to test the reasonableness of the conjunctive use benefit that is being allocated to groundwater users from the surface water and recycled water systems. For example, the analysis shown in Exhibit 11 produces a ratio in relation to the existing system. The existing system has a ratio of 1. The ratio for Scenario 1 is approximately 0.99 and approximately 1.02 for Scenario 2.

The results for Scenario 1 produce a ratio of the predominately GW only system that is very close to 1. This indicates that the costs to build and operate the existing system or a predominately GW only system would be very similar and therefore the rates for GW and SW should be similar. Based on this analysis, it would be expected that the cost of service per unit for SW would be fairly comparable to the cost of service per unit of GW. However, in FY 2015 the District budgeted additional costs to update SW policies that had not been revised since 1974. Since there is very little M&I SW use in the South Zone (1.8%) relative to M&I GW use in the South Zone, the unit cost per SW escalates dramatically. There are years in which the GW system may have specific studies or water quality measures performed for the GW system. Again, since there is much more GW use in the South Zone than SW use, these costs get spread over many more AF of GW and therefore the resulting unit cost of service for GW can be lower than that for SW, or higher (as it was in FY 2011). Nonetheless, the analysis using the predominately GW only system approach produces results that indicate the SW and GW system costs should be similar. If we apply the ratios from the predominately GW only analysis to the District's current rate setting practices, then the current system is represented by the unit cost of the South Zone $319 (for M&I customers only) as shown in Exhibit 12 and is equal to a ratio of 1. Since the ratio for Scenario 1 is less than 1 (0.99), the rate for SW customers could be less than the unit cost ($319) of the South Zone. It could be 99.4% of the unit cost or $317 which would mean the District could have transferred at most $55,000 from SW to GW. However, since the results are so close to 1.0, and since the cost of service for SW and GW can fluctuate from year to year, the ratio for SW has been set equal to 1.0, producing a SW rate ($319) equal to the GW rate.

In practice, the District is setting the SW rate above the GW rate to account for the water master costs. In FY 2015, the District transferred $44,000 from SW to GW (as shown in Exhibit 3). Based on our analysis as shown in Exhibit 12, the District could have transferred $54,000 from SW to GW to make the rates equal. Since the District is transferring less from SW to GW, their rate setting practices are justified.

The District's rate setting practices would also be justified if costs from the GW system transferred to the SW system. Based on the costs for a given fiscal year, the unit cost of service for GW could be higher than the unit cost of service for SW (as was experienced in FY 2011). For example, assume the unit cost of service for GW on line 35 in Exhibit 13 was $294 and the unit cost for SW was $287. Setting the GW and SW rates equal causes costs from the GW system to be transferred to the SW system. As shown in line 38, the District would transfer $16,000 from GW to SW users. Since the District would actually set the SW rate to $18.60 more per AF for SW to reflect the water master costs, the District would actually transfer approximately $25,000 from GW to SW.

It is reasonable that in a given year, costs could be transferred from surface water to groundwater or vice versa because of the interdependent relationship between surface water and groundwater. Surface water is effectively in-lieu groundwater use that is permitted by the District to help preserve the groundwater basin. Therefore, the costs related to preserving the groundwater basin provide value to surface water users because those costs help make surface water available that otherwise would need to be used for groundwater recharge. Similarly, the costs related to providing surface water benefit groundwater users because surface water usage helps preserve the groundwater basin.

The ratio for Scenario 2 is slightly greater than 1.0 (1.02), meaning the RW rate should be slightly higher than the unit cost ($319) in the South Zone (2% higher or $325 as shown in Exhibit 12). The difference between the calculated rates ($319 for SW and GW and $325 for RW) and the unit costs ($427 for SW and $1,460 for RW), multiplied by the AF of usage, represents the conjunctive use benefit of the system that can be shared by GW and/or SW users. It should be pointed out that the cost of service for RW ($1,460) is much higher than the average unit cost for M&I use in the South Zone ($319). The reason for the significant variance is due to the amount of RW water use. RW water use only represents approximately 2% of the total M&I water use in the South Zone. The costs to acquire capacity in the recycled water systems and to operate the recycled system in the South Zone have to be spread over a small amount of AF in the South Zone which results in a very high cost of service per AF for RW.

In practice, the District is setting the RW rate less than the GW. Our analysis indicates the RW rate should be slightly *higher* than the GW rate. The District transferred $813,000 from RW to GW in FY 2015 as shown in Exhibit 3. Our analysis as shown in Exhibit 12, indicates the District should have transferred less ($794,000) from RW to GW. While our analysis indicates the District should transfer less from RW, it does show that the District is justified in transferring a certain level of costs from RW to GW and/or SW to represent the conjunctive use benefit of RW to GW and SW. The District by legislation can transfer costs in order to effectively manage all water supply sources. Specifically, the District was formed under the

District Act to "manage the groundwater system…[6]" and therefore the District can choose to transfer costs to the point where equilibrium is achieved between the GW, SW and RW rates. Furthermore, in response to the persistent drought in California, the California legislature passed the Sustainable Groundwater Management Act (Act) in the fall of 2014. One of the provisions of this Act is "To provide local and regional agencies the authority to sustainably manage groundwater"[7]. Additional justification for the District's rate setting practices can be also found in Sections III and IV of this report.

It should be noted that as stated earlier in this report, the analysis focused on the South Zone since the majority of the surface water use occurs in the South Zone. Surface water use in the South County (both M&I and AG) represents 0.7% of the total use in both the South and North Zones, and surface water use in the North County represents even less use, 0.4% of the total use. The conjunctive use benefit identified by the analysis in the South Zone can be applied to the North Zone. The ratio of the existing system to the predominately GW only system for Scenario 1 resulted in a ratio of .994, indicating that the existing system in the South Zone would cost less to build than a predominately groundwater only system. If we assume the same assumptions as those in the South Zone, the existing surface water system in the North Zone would also cost less to build than a predominately groundwater only system. Accordingly, a groundwater/surface water conjunctive use benefit analysis for the North County would be expected to generate results similar to that of the South County.

[6] Santa Clara Valley Water District Act. http://www.valleywater.org/About/DistrictAct.aspx
[7] http://www.leginfo.ca.gov/pub/13-14/bill/asm/ab_1701-1750/ab_1739_bill_20140818_amended_sen_v94.html

Exhibit 12: Application to Rate Setting Process for Scenarios 1 and 2

	FY '15 Projection ($K)	Zone W-5							
	SCENARIO 1 & 2	GW		SW		RW		Total W-5	
		M&I	AG	M&I	AG	M&I	AG		
1	**Operating Outlays**								
2	Operations/Operating Projects	7,597	5,723	165	423	110	94	14,112	
3	SWP Imported Water Costs	-	-	-	-	-	-	-	
4	Debt Service	-	-	-	-	-	-	-	
5	**Total Operating Outlays**	7,597	5,723	165	423	110	94	14,112	
6	Step 2- Identify revenue reqmnts								
7	**Capital & Transfers**								
8	Operating Transfers Out	-	-	-	-	-	-	-	
9	Capital Outlays excl. carryforward	-	-	-	-	-	-	-	
10	**Total Capital & Transfers**	-	-	-	-	-	-	-	
11	**Total Annual Program Costs**	7,597	5,723	165	423	110	94	14,112	
12		Step 3 - Allocate costs to customer classes							
13	**Revenue Requirement Offsets**								
14	Capital Cost Recovery	1,395	1,090	22	57	595	510	3,669	
15	Debt Proceeds	-	-	-	-	-	-	-	
16	Inter-governmental Services	(68)	(53)	(1)	(3)	-	-	(124)	
17	SWP and W-1 Property Taxes	(671)	(524)	(10)	(27)	(15)	(13)	(1,260)	
18	South County Deficit/Reserve	1,081	844	17	44	24	20	2,030	
19	Interest Earnings	-	-	-	-	-	-	-	
20	Inter-zone Interest	(16)	(12)	(0)	(1)	(0)	(0)	(30)	
21	Capital Contributions	-	-	-	-	-	-	-	
22	Other	(54)	(42)	(0)	(1)	-	-	(97)	
23	Reserve Requirements	-	-	-	-	-	-	-	
24	**Adjusted Revenue Requirement (FY 15)**	**9,264**	**7,025**	**192**	**492**	**714**	**612**	**18,300**	
25	**Adjusted Revenue Requirement (FY 12 adj)**	86	(884)	21	(46)	308	(295)	(810)	
26	**Total Adjusted Revenue Requirement**	**9,350**	**6,141**	**213**	**447**	**1,022**	**317**	**17,490**	
27	Volume (KAF)	32.0	25.0	0.5	1.3	0.7	0.6	60.1	
28									
29	Revenue Requirement per AF	$ 292	$ 246	**$ 427**	$ 343	**$ 1,460**	$ 528	***$ 319***	**Ratio**
30		Step 5 - Develop unit costs by customer class						***Unit Cost***	**1.00 SW**
31	**Adjustments for Agricultural Preservation**								**1.02 RW**
32	Allocate WU 1% Ad Valorem Prop Tax	-	(4,471)	-	-	-	-	(4,471)	
33	Transfer GF 1% Ad valorem Prop Tax	-	(940)	-	-	-	-	(940)	
34	Transfer WS 1% Ad Valorem Prop Tax	-	(251)	-	(397)	-	(291)	(940)	
35	Revenue Requirement per AF	$ 292	$ 19.1	$ 427	$ 37.7	$ 1,460	$ 42.9		
36	Step 6 - Rate Design								
37	**Adjustments to Facilitate Conjunctive Use**								
38	Reallocate TW/SW/RW costs	**848**	**-**	**(54)**	**-**	**(794)**	-	-	
39	Other							-	
40	Charge per AF	**$ 319**	$ 19.1	**$ 319**	$ 38	**$ 325**	$ 42.9		

Exhibit 13: Application to Rate Setting Process for Scenarios 1 and 2- Assuming Unit Cost for GW is <u>less</u> than that for SW

	FY '15 Projection ($K)	Zone W-5							
	SCENARIO 1 & 2 - modified	GW		SW		RW		Total W-5	
		M&I	AG	M&I	AG	M&I	AG		
1	**Operating Outlays**								
2	Operations/Operating Projects	7,667	5,723	95	423	110	94	14,112	
3	SWP Imported Water Costs	-	-	-	-	-	-	-	
4	Debt Service	-	-	-	-	-	-	-	
5	**Total Operating Outlays**	7,667	5,723	95	423	110	94	14,112	
6	Step 2- Identify revenue reqmnts								
7	**Capital & Transfers**								
8	Operating Transfers Out	-	-	-	-	-	-	-	
9	Capital Outlays excl. carryforward	-	-	-	-	-	-	-	
10	**Total Capital & Transfers**	-	-	-	-	-	-	-	
11	**Total Annual Program Costs**	7,667	5,723	95	423	110	94	14,112	
12		Step 3 - Allocate costs to customer classes							
13	**Revenue Requirement Offsets**								
14	Capital Cost Recovery	1,395	1,090	22	57	595	510	3,669	
15	Debt Proceeds	-	-	-	-	-	-	-	
16	Inter-governmental Services	(68)	(53)	(1)	(3)	-	-	(124)	
17	SWP and W-1 Property Taxes	(671)	(524)	(10)	(27)	(15)	(13)	(1,260)	
18	South County Deficit/Reserve	1,081	844	17	44	24	20	2,030	
19	Interest Earnings	-	-	-	-	-	-	-	
20	Inter-zone Interest	(16)	(12)	(0)	(1)	(0)	(0)	(30)	
21	Capital Contributions	-	-	-	-	-	-	-	
22	Other	(54)	(42)	(0)	(1)	-	-	(97)	
23	Reserve Requirements	-	-	-	-	-	-	-	
24	**Adjusted Revenue Requirement (FY 15)**	**9,334**	**7,025**	**122**	**492**	**714**	**612**	**18,300**	
25	**Adjusted Revenue Requirement (FY 12 adj)**	86	(884)	21	(46)	308	(295)	(810)	
26	**Total Adjusted Revenue Requirement**	**9,420**	**6,141**	**143**	**447**	**1,022**	**317**	**17,490**	
27	Volume (KAF)	32.0	25.0	0.5	1.3	0.7	0.6	60.1	
28									
29	Revenue Requirement per AF	$ 294	$ 246	**$ 287**	$ 343	**$ 1,460**	$ 528	***$ 319***	**Ratio**
30		Step 5 - Develop unit costs by customer class						***Unit Cost***	**1.00 SW**
31	**Adjustments for Agricultural Preservation**								**1.02 RW**
32	Allocate WU 1% Ad Valorem Prop Tax	-	(4,471)	-	-	-	-	(4,471)	
33	Transfer GF 1% Ad valorem Prop Tax	-	(940)	-	-	-	-	(940)	
34	Transfer WS 1% Ad Valorem Prop Tax	-	(251)	-	(397)	-	(291)	(940)	
35	Revenue Requirement per AF	$ 294	$ 19.1	$ 287	$ 37.7	$ 1,460	$ 42.9		
36	Step 6 - Rate Design								
37	**Adjustments to Facilitate Conjunctive Use**								
38	Reallocate TW/SW/RW costs	**778**	**-**	**16**	**-**	**(794)**	-	-	
39	Other							-	
40	Charge per AF	**$ 319**	$ 19.1	**$ 319**	$ 38	**$ 325**	$ 42.9		

F. Intangibles

As shown in Exhibit 11, the existing system appears to be slightly less expensive than had the District built a predominately groundwater only system to serve SW customers, and slightly more expensive than had the District built a predominantly groundwater only system to serve RW customers. However, as mentioned previously the costs for the predominately groundwater only alternatives exclude several costs, such as land costs which would be needed for the additional recharge ponds. In addition, the costs for the predominately groundwater only system exclude the following costs:

- any infrastructure to provide the same reliability as provided by the existing system
- costs to ensure that all regulatory standards are met

In the original analysis conducted by RFC that is documented in the 2011 Report, land costs were estimated and added to the predominately groundwater only scenario to demonstrate the range of ratios between the existing system and predominately groundwater only system resulting from intangible items. However, the recharge areas for the predominately groundwater only scenarios developed in this analysis require much less infrastructure and thus the land and other intangible items will be much less than determined for the original analysis (2011 Report). Furthermore, the calculated ratios for Scenarios 1 and 2 produced ratios very close to 1. Adding more costs to Scenario 1 would cause the ratio to decrease even further which means the District could transfer even more costs from either SW or GW (depending on the unit cost for SW and GW) to achieve a rate of 1.0. Adding more costs to Scenario 2 would cause the ratio to decrease and therefore the rate would approach 1.0, or the unit cost of the South Zone, meaning it could be equal to the GW rate. This would be accomplished by the District transferring less costs from RW to GW or SW. (The maximum cost that should be transferred are those that would equate the RW to the GW rate which are $794,000 for FY 2015). These results are only provided to exemplify the conjunctive use nature of the District's system and the reasonableness of the District's current rate setting practices. However, the District must manage its water supply sources and therefore rate setting for GW, RW, and SW rates need additional consideration. As mentioned previously, Sections III and IV of this report discuss recycled water, surface water, and groundwater rate setting practices in the water industry.

Section III: Recycled Water Rate Setting Practices in the Water Industry and Benchmarking Analysis

A. Recycled Water Use in the State of California

In January 2014, California Governor Edmund G. Brown issued a Drought State of Emergency since 2013 and 2014 were the driest years on record[8]. The drought conditions in California, and many other western states, have prompted water agencies to find alternative water sources, one of which includes recycled water. Recycled water has been used for decades but as water sources have diminished, the supply of recycled water has increased. According to a 2011 recycled water survey conducted by the State Water Resources Control Board (of the California EPA), the amount of recycled water has increased by 27% from 2001 to 2011 and is primarily used for agricultural irrigation. While recycled water has been used for years for irrigation purposes (especially in California and Florida), the drought has caused water agencies to investigate the use of recycled water to replenish groundwater and surface water sources. Specifically, Governor Edmund G. Brown signed state bill 322 that "requires by December 31, 2016, the Department of Public Health in consultation with the State Water Resources Control Board, to investigate the feasibility of developing uniform water recycling criteria for direct potable reuse, to provide a final report on that investigation to the Legislature no later than December 31, 2016; and requires the Department to complete the public review draft of its report by September 1, 2016."[9] Many agencies, such as Orange County and the Los Angeles Water Board are already using recycled water to recharge their aquifers and groundwater basin.[10]

In response to Governor Brown's Drought State of Emergency, the State Water Resources Control Board has introduced new low interest rate financing for recycled projects that meet the Governor's drought requirements[11]. As a result, more California water agencies will have a new funding source to assist in the pursuit of recycled water. The combination of decreasing water supplies and the ability to obtain a low cost funding source will facilitate further growth of recycled water as an alternate water supply source in the state of California.

B. National Rate Setting Practices for Recycled Water

The American Water Works Association (AWWA) and the Water Environment Federation (WEF) teamed to conduct a recycled water survey in 1999/2000 and updated this survey in 2007[12]. The majority of the survey respondents were from the states of California and Florida, since these two states have pursued recycled water more aggressively due to drought conditions and diminishing water supply sources. Survey respondents indicated that they set their recycled water rates based on a market analysis, cost of service analysis, or based on a percentage of the potable water rate (the latter of which was the most prominent

[8] http://gov.ca.gov/news.php?id=18368
[9] http://gov.ca.gov/news.php?id=18258
[10] http://www.ca.gov/drought/news/story-36.html
[11] http://www.acwa.com/news/water-recycling/state-board-approves-low-interest-loan-terms-recycling-projects
[12] Water Reuse Rates and Charges 2000 and 2007 Survey Results; American Water Works Association; AWWA Water Reuse Committee; 2008.

method for setting recycled water rates). The survey indicated that for those utilities that set rates at a percentage of the potable water rate, the rates for recycled water ranged from 20% to 100% of the potable water rate with 80% being the median. Respondents also indicated their recycled rates were recovering less than 25% of the operating expenses for their recycled water systems.

As indicated by the survey results, many utilities do not set recycled water rates to recover the full cost of the recycled water system for several reasons. First, the costs for the recycled water system can be shared by water and wastewater users because of the benefits provided by recycled water. For example, many agencies are required to treat their wastewater effluent to specific standards before discharging into oceans or other water sources. It may be more economical to use this effluent to produce recycled water than it is to treat it and discharge it into water sources. As a result, it is appropriate to allocate some of the recycled costs to the wastewater utility since producing recycled water reduces discharging costs. It is also appropriate to share some of the recycled water costs with the water utility since the availability of recycled water serves as an alternate water supply source which can take the place of more expensive alternative water supply sources. Second, many recycled rates may not reflect the full cost of the recycled water system because many water agencies want to promote the use of recycled water. In order for customers to use recycled water, it must be priced at or below the potable water rate, otherwise customers are not incentivized to use recycled water.

Recycled water provides several benefits to the District's service area *and beyond*. In the South Zone, recycled water provides an alternative water source that preserves groundwater and surface water supplies. By preserving groundwater, recycled water assists in maintaining the safe yields of the basins and assists in avoiding subsidence and/or salinity issues. Recycled water is also a drought resistant water source. Therefore during droughts, recycled water helps reduce the amount of water the District would have to purchase on the spot market. Recycled water also provides a benefit *beyond* the District's service area. For example, the District's use of recycled water allows less wastewater to be discharged into the Pajaro River. The District does not provide wastewater service but wastewater service is provided by some of the District's wholesale water customers. These wholesale customers provide water and wastewater service to retail customers. Some of these retail customers benefit from less wastewater discharged into the Pajaro River. However, since the District does not provide wastewater service directly to these retail customers, it cannot share some of the recycled water costs for wastewater activities with these customers.

C. Benchmarking Analysis for Recycled Water

As mentioned in the 2007 AWWA/WEF survey, many utilities set their recycled rates at a percentage of the potable water rate (the median for the survey was 80%). RFC conducted a benchmarking survey of recycled and potable water rates (based on 2014 rates, if available), shown in Exhibit 14. As shown, the median recycled rate to potable water rate for all survey participants is 87%, which is comparable to the 2007 AWWA/WEF survey results. As shown, the District's recycled rate is 89% of the surface water rate in the

South Zone. The District's recycled water rate as a percentage of the surface water rate is consistent with the survey performed by RFC and with the national survey performed by AWWA/WEF.

Exhibit 14: Regional Benchmarking Analysis for Recycled Water

Water Agency	Potable Water Rate	Recycled Water Rate	Recycled Rates to Potable Rates
Santa Clara Valley Water District - South Zone (per AF)	$ 337.60 (surface water)	$ 299.00	**89%**
Irvin Ranch Water District, CA (1)			
Recycled water used for irrigation purposes			**90%**
Recycled water used by industrial customers for cooling towers, etc.			**60%**
City of San Jose, CA (per ccf)			
Irrigation	$ 3.390	$ 2.110	**62%**
Industrial	$ 3.390	$ 1.870	**55%**
Agricultural	$ 3.390	$ 1.830	**54%**
Irrigation - Former Well User	$ 1.710	$ 1.470	**86%**
Industrial/Agricultural - Former Well User	$ 1.710	$ 1.540	**90%**
City of Sunnyvale, CA (per ccf)			
Landscape Irrigation	$ 4.830	$ 4.360	**90%**
Agricultural and Institutional	$ 2.300	$ 2.070	**90%**
City of Santa Clara, CA (ccf)			
Irrigation	$ 3.800	$ 2.310	**61%**
Industrial	$ 3.800	$ 1.950	**51%**
San Jose Water Company, CA (ccf)			
Irrigation	$ 2.740	$ 2.230	**81%**
Industrial	$ 2.740	$ 1.730	**63%**
East Bay Municipal Water District, CA (ccf)			
Tier 1	$ 2.910	$ 3.170	**109%**
Tier 2	$ 3.600	$ 3.170	**88%**
Tier3	$ 4.420	$ 3.170	**72%**
City of Long Beach, CA (per ccf) (2)			
Tier 1A	$ 1.269		
Tier 1B	$ 2.283		
Tier 2	$ 2.537		
Tier 3	$ 3.806		
Peaking (70% of Tier II potable)		$ 1.766	**70%**
Non-Peaking (50% of Tier II potable)		$ 1.269	**50%**
Interruptible (50% of Tier II potable)		$ 1.269	**50%**
City of Santa Rosa, CA (kgal)			
Commercial/Industrial	$ 5.360	$ 5.090	**95%**
Landscape Irrigation Tier 1: up to 125% of water budget	$ 5.130	$ 4.860	**95%**
Landscape Irrigation Tier 2: 126% - 200% of water budget	$ 6.980	$ 6.980	**100%**
Landscape Irrigation Tier 3: > 201% of water budget	$ 10.480	$ 10.480	**100%**
Tucson Water, AZ per ccf (3)			
Industrial	$ 2.090		
Recycled Water rate per ccf		$ 1.870	**89%**
San Antonio Water System, TX (kgal)			
Wholesale Potable Rates :Base			
Base	$ 0.816		
Tier 1: 100% - 125% of Base	$ 1.225		
Tier 2: 125% - 175% of Base	$ 1.769		
Tier 3 : > 75% of Base	$ 2.502		
Recycled Water rate per ccf (based on average of tiered rates)		$ 2.440	**155%**
MEDIAN			**87%**
AVERAGE			**81%**

(1) http://www.irwd.com/services/recycled-water-rates

Quote from their website: "With the goal of encouraging the use of recycled water for non-potable purposes, we provide our customers with discounts when purchasing recycled water. IRWD sells recycled water used for irrigation purposes for 10 percent less than potable water. Recycled water sold for industrial purposes such as toilet flushing, cooling towers, composting, and concrete production, is sold for 40 percent less than potable water."

(2) http://www.lbwater.org/how-reclaimed-water-rates-are-determined

(3) Tucson Water discusses pricing policy for recycled water (discount) on their website: http://www.tucsonaz.gov/files/water/Reclaimed_Water_Rates_Oct_2012_post.doc.pdf

Section IV: Other Rate Setting Practices in the Water Industry and Benchmarking Analysis

A. Rate Setting Practices in the Water Industry

According to the California Department of Water Resources, groundwater supplies 30 to 46 percent of the state's total water supply.[13] The rest of the water supply is comprised of surface water, imported water, recycled water, and in some cases, ocean water that has been treated by a desalination plant. Water agencies in California may have one or several of these water supply sources. Some agencies have been formed to specifically manage their water supply sources, especially if groundwater has been depleted to levels that have threatened salt water intrusion and/or subsidence. The mission or purpose of each agency is one reason rates assessed by water agencies vary. Other reasons for the different types of rates assessed by water agencies is the type of customers they serve (retail or wholesale customers), and each water agency has different sources of water supply. Most agencies that serve wholesale customers classify rates as either treated water or untreated water service. The untreated rate represents water that can be a combination of imported water, groundwater, recycled water, or surface water. Some agencies classify rates based on both the water source and the type of water delivered, such as groundwater, surface water, or recycled water. While many agencies might have groundwater or surface water as water supply sources, not many of them assess a separate groundwater or surface water rate. As shown in the survey conducted by RFC in Exhibit 15, most of the water agencies classify their rates as untreated rates. However, the survey results can be used to compare groundwater rates, surface water rates, and untreated water rates.

B. Benchmarking Analysis for GW and Untreated Water Rates

As shown in Exhibit 15, the District's groundwater rate in the South Zone is 94% of the surface water rate (untreated rate). As shown in the survey in Exhibit 15 six water agencies have specific groundwater rates. Since only a few of the agencies had surface water rates it was determined that the untreated water rates should be used in the comparison. The untreated rates represent either surface water, groundwater, purchased water, recycled water, or combination thereof. The median and average groundwater rate to the median and average untreated water rate produces a range of 75% to 82%, and the range of untreated rates per AF is approximately $23 to $950. The District's groundwater rate to surface water rate ratio (94%) is slightly higher than the ratio of groundwater rates to untreated rates of the comparison group but the District's groundwater and surface water rates are within the range of untreated rates assessed by other agencies.

[13] http://www.water.ca.gov/groundwater/

Exhibit 15: Regional Benchmarking Analysis for Surface Water and Untreated Water Rates

Water Agency	Untreated Rate (surface water, groundwater, recycled, etc)	Groundwater Rate
Santa Clara Valley Water District (per AF) - South Zone	$ 338.00	$ 319.00
Groundwater rate as % of SW rate		
Orange County (1)		$ 294.00
Coachella Valley Water District		varies by basin ($52 - $110)
Pajaro Valley Water District (2)	$ 338.00	varies by zone ($179 - $215)
Stockton East Water District	$ 23.00	$ 211.14
Zone 7 Water Agency	$ 110.00	
Modesto Irrigation District	$ 32.50	
Sonoma County Water Agency (3)	$ 951.88	
San Francisco Public Utilities Commission	$ 117.61	
Water Replenishment District of Southern California		$ 268.00
Metropolitan Water District - Tier 1 (full service)	$ 582.00	
Antelope Valley-East Kern Water Agency	$ 288.00	
Southern Nevada Water Authority	$ 293.00	
MEDIAN (4)	**$ 291**	**$ 240**
AVERAGE	**$ 304**	**$ 228**
GW rate to Untreated Rate - Median	**82.5%**	
GW rate to Untreated Rate - Average	**75.1%**	

(1) The groundwater rate applies to groundwater use within the wholesale customer's acre feet allotment (which is 72% of their base allotment). All use above that is assessed at the Metropolitan Water District treated water rate.

(2) The Pajaro Valley Water District groundwater rates vary based on zone. The surface water rate is comprised of recycled water, surface water and groundwater.

(3) Represents wholesale charges for "Other Agency Customers/Wholesale Charges (Water Co's and Public Agencies)" as stated on their rate sheet.

(4) To calculate the median, the averages for the range of groundwater rates for the Coachella Valley Water District and the Pajaro Valley Water District were used.

Appendices

APPENDIX A: Indices Used to Escalate Fixed Costs

Handy-Whitman Index - Pacific Region (1)							
Original Date	**Distribution Mains-** Average All Types	Electric Pumping Equipment	Small Treatment Plant Equipment	**Source of Supply** - Collecting and Impounding Res.	Elevated Steel Tanks	Average Index (Used for Admin/Gen Only)	**Water Treatment Plant** - Structures and Improvements
	D			**S**		**AG**	**W**
1934	20			16		17	15
1935	20	24	19	16		18.8	15
1936	20	25	19	16		19.2	16
1937	23	26	21	18		21	17
1938	23	26	22	18		21.2	17
1939	23	26	22	18		21.2	17
1940	23	26	22	17		21	17
1941	24	27	23	19		22.2	18
1942	26	27	24	21		23.6	20
1943	27	27	25	21		24	20
1944	27	27	25	21		24.2	21
1945	27	27	26	22		24.6	21
1946	32	31	31	25		28.6	24
1947	38	39	36	29		34.2	29
1948	44	43	40	33	26	38.4	32
1949	45	45	41	34	25	37.8	24
1950	46	49	43	35	26	41.6	35
1951	49	55	46	37	28	44.8	37
1952	50	55	46	39	29	45.4	37
1953	52	55	48	41	31	47	39
1954	55	55	50	43	31	48.6	40
1955	58	56	51	45	33	50.4	42
1956	61	63	54	48	35	54.4	46
1957	64	69	55	50	38	57.2	48
1958	67	73	57	52	38	59.8	50
1959	70	74	60	54	38	62	52
1960	73	74	62	56	38	63.6	53
1961	75	71	63	57	37	64	54
1962	76	71	63	58	36	64.4	54
1963	77	71	65	59	37	65.6	56
1964	78	73	66	61	38	67.2	58
1965	78	74	68	63	38	68.6	60

APPENDIX A: Indices Used to Escalate Fixed Costs (continued)

Handy-Whitman Index - Pacific Region (1)							
Original Date	**Distribution Mains-** Average All Types	Electric Pumping Equipment	Small Treatment Plant Equipment	**Source of Supply -** Collecting and Impounding Res.	Elevated Steel Tanks	Average Index (Used for Admin/Gen Only)	**Water Treatment Plant -** Structures and Improvements
	D			**S**		**AG**	**W**
1966	79	78	71	66	41	71.2	62
1967	80	81	73	69	44	73.4	64
1968	82	81	75	72	48	75.2	66
1969	84	84	79	75	55	78.6	71
1970	89	89	84	79	71	83.2	75
1971	96	93	91	85	80	89.4	82
1972	98	96	95	93	86	94.8	92
1973	100	100	100	100	100	100	100
1974	133	122	122	119	152	122.6	117
1975	152	155	146	134	183	143.8	132
1976	161	174	160	140	182	155	140
1977	168	184	170	148	183	163.8	149
1978	181	192	185	161	195	176	161
1979	194	205	201	177	206	191	178
1980	212	222	224	195	228	211.2	203
1981	233	245	248	205	250	230	219
1982	246	260	270	211	244	243.4	230
1983	254	271	286	215	197	252	234
1984	258	277	292	225	200	258.6	241
1985	265	282	301	231	198	265.6	249
1986	264	284	306	234	207	268.2	253
1987	271	299	312	240	219	275.8	257
1988	283	303	321	248	261	284.2	266
1989	295	336	333	255	267	298.8	275
1990	296	349	339	259	281	304.6	280
1991	301	350	340	259	246	306.2	281
1992	300	370	349	263	284	313.4	285
1993	311	378	360	274	249	324.4	299
1994	316	426	364	287	242	341.2	313
1995	318	437	370	292	250	347.6	321
1996	323	446	379	298	269	354.2	325
1997	331	476	393	309	271	368.6	334
1998	333	486	403	312	283	374.6	339
1999	346	499	413	319	288	384.8	347
2000	342	532	424	327	300	398.8	369

APPENDIX A: Indices Used to Escalate Fixed Costs (continued)

Handy-Whitman Index - Pacific Region (1)							
Original Date	**Distribution Mains-** Average All Types	Electric Pumping Equipment	Small Treatment Plant Equipment	**Source of Supply** - Collecting and Impounding Res.	Elevated Steel Tanks	Average Index (Used for Admin/Gen Only)	**Water Treatment Plant** - Structures and Improvements
	D			**S**		**AG**	**W**
2001	357	531	434	333	314	406	375
2002	365	533	449	339	429	415.2	390
2003	381	546	454	344	429	423.2	391
2004	383	569	470	359	481	439.4	416
2005	429	611	496	380	524	472	444
2006	454	619	511	394	596	488.4	464
2007	488	639	529	410	657	508.8	478
2008	509	640	592	431	680	535.4	505
2009	585	679	657	441	866	579.8	537
2010	589	707	683	445	866	594	546
2011	598	708	705	458	1079	606.6	564
2012	635	780	741	466	1059	641	583
2013	674	800	771	478	1089	665.6	605

(1) Handy-Whitman Index of Public Utility Construction Costs, Trends of Construction Costs, Bulletin No. 179 ; 1912 to January 1, 2014.

Appendix B: Sample of Escalation of Existing Fixed Assets to 2013 Dollars

Asset Description	In-Service D	Cost	%SC	SC $	Cost Center	HW I Code	HWI	HWI 2013	HWI Escalation Factor	Replacement Cost
Microscope Binocular	01-Jan-97	9,077.00	11.9%	$ 1,080	Admin & General	AG	368.6	665.6	1.81	$ 1,951
Microscope Binocular W/Video	01-Jan-97	32,050.00	11.9%	$ 3,814	Admin & General	AG	368.6	665.6	1.81	$ 6,887
Camera And Access Control System	01-Jan-01	7,733.28	11.9%	$ 920	Admin & General	AG	406	665.6	1.64	$ 1,509
Mixer 6-Capacity	01-Jan-97	8,200.00	11.9%	$ 976	Admin & General	AG	368.6	665.6	1.81	$ 1,762
Security Monitoring System	01-Jan-00	24,339.13	11.9%	$ 2,896	Admin & General	AG	398.8	665.6	1.67	$ 4,834
CCTV System	01-Jan-00	103,381.88	11.9%	$ 12,302	Admin & General	AG	398.8	665.6	1.67	$ 20,533
Security Access Control System	01-Jan-00	56,820.80	11.9%	$ 6,762	Admin & General	AG	398.8	665.6	1.67	$ 11,285
Cctv System	01-Jan-01	70,740.40	11.9%	$ 8,418	Admin & General	AG	406	665.6	1.64	$ 13,801
3 Phase Best Power 20 Kva	01-Jan-01	20,567.50	16.1%	$ 3,311	Raw Water T&D	D	357	674	1.89	$ 6,252
Reader Meter Hand Held	01-Jan-97	14,785.00	11.9%	$ 1,759	Admin & General	AG	368.6	665.6	1.81	$ 3,177
Copier	01-Jan-03	9,266.20	11.9%	$ 1,103	Admin & General	AG	423.2	665.6	1.57	$ 1,734
Telephone System	01-Jan-97	7,986.00	11.9%	$ 950	Admin & General	AG	368.6	665.6	1.81	$ 1,716
Telephone System	01-Jan-97	10,880.00	11.9%	$ 1,295	Admin & General	AG	368.6	665.6	1.81	$ 2,338
Telephone System	01-Jan-97	11,090.00	11.9%	$ 1,320	Admin & General	AG	368.6	665.6	1.81	$ 2,383
Telephone System	01-Jan-97	36,937.00	11.9%	$ 4,396	Admin & General	AG	368.6	665.6	1.81	$ 7,937
Telephone System	01-Jan-97	81,115.00	11.9%	$ 9,653	Admin & General	AG	368.6	665.6	1.81	$ 17,430
Com-Hew-Lh012,64Mb,Hot Swap Ult	01-Jan-98	6,680.65	11.9%	$ 795	Admin & General	AG	374.6	665.6	1.78	$ 1,413
Color Printer	01-Jan-03	7,188.87	16.1%	$ 1,157	Raw Water T&D	D	381	674	1.77	$ 2,047
Tester Cable	01-Jan-97	6,664.00	11.9%	$ 793	Admin & General	AG	368.6	665.6	1.81	$ 1,432
Laserjet Printer	01-Jan-01	7,678.80	11.9%	$ 914	Admin & General	AG	406	665.6	1.64	$ 1,498
Digital Scanner	01-Jan-02	7,150.00	11.9%	$ 851	Admin & General	AG	415.2	665.6	1.60	$ 1,364
Designjet 755Cm Plotter,C	01-Jan-98	7,568.84	11.9%	$ 901	Admin & General	AG	374.6	665.6	1.78	$ 1,600
EIMCO Drive	01-Jan-03	83,750.00	16.1%	$ 13,484	Raw Water T&D	D	381	674	1.77	$ 23,853
Netserver	01-Jan-00	9,464.30	11.9%	$ 1,126	Admin & General	AG	398.8	665.6	1.67	$ 1,880
SCADA Server Development for WIN 95	01-Jan-97	17,170.84	11.9%	$ 2,043	Admin & General	AG	368.6	665.6	1.81	$ 3,690
Adj Freq AC Drive 200 HP	01-Jan-97	15,439.66	11.9%	$ 1,837	Admin & General	AG	368.6	665.6	1.81	$ 3,318
Adj Freq AC Drive 200 HP	01-Jan-97	15,439.66	11.9%	$ 1,837	Admin & General	AG	368.6	665.6	1.81	$ 3,318
Kayak Xw Ecc Ram Dim	01-Jan-98	14,175.34	11.9%	$ 1,687	Admin & General	AG	374.6	665.6	1.78	$ 2,997
Netserver	01-Jan-00	9,351.99	11.9%	$ 1,113	Admin & General	AG	398.8	665.6	1.67	$ 1,857
Netserver	01-Jan-00	9,351.99	11.9%	$ 1,113	Admin & General	AG	398.8	665.6	1.67	$ 1,857
Netserver	01-Jan-00	9,351.99	11.9%	$ 1,113	Admin & General	AG	398.8	665.6	1.67	$ 1,857
Netserver	01-Jan-00	9,108.16	11.9%	$ 1,084	Admin & General	AG	398.8	665.6	1.67	$ 1,809
Omnibook With Docking Station	01-Jan-00	6,329.38	11.9%	$ 753	Admin & General	AG	398.8	665.6	1.67	$ 1,257
Omnibook With Docking Station	01-Jan-00	6,329.39	11.9%	$ 753	Admin & General	AG	398.8	665.6	1.67	$ 1,257
Ntsvr/Vga/Hot Swap/Oem Win	01-Jan-98	6,938.80	11.9%	$ 826	Admin & General	AG	374.6	665.6	1.78	$ 1,467

Appendix C: District Staff Analysis for Additional Infrastructure Needed for Scenarios 1 and 2

Santa Clara Valley Water District

MEMORANDUM

FC 14 (01-02-07)

TO: Darin Taylor

FROM: Vanessa De La Piedra

SUBJECT: Benefits of South County Surface Water and Recycled Water Deliveries

DATE: February 6, 2015

The District manages surface water and groundwater conjunctively to maximize water supply reliability. This memorandum describes the benefits of surface water and recycled water deliveries in South County (groundwater charge zone W5) and estimates the area needed for additional groundwater recharge if surface water or recycled water demands had to be met by groundwater pumping.

Background

There are about 80 surface water accounts and 9 recycled water accounts for South County. Raw surface water and recycled water are non-potable supplies that are of lower quality than groundwater. However, these supplies are important to help meet non-potable uses such as irrigation and industrial uses. The availability of surface water and recycled water reduces groundwater demand, and therefore results in increased groundwater reserves for potable use.

If surface water or recycled were not available in South County, related users would switch to groundwater to meet their water supply needs. For some users, this would require the construction of new wells (e.g., if their existing wells or potable drinking water source did not have sufficient capacity to supply the increased demand). Well construction costs are highly variable depending on the location and capacity, but are assumed to range from approximately $50K for smaller users to $300K for large users (e.g., golf courses).

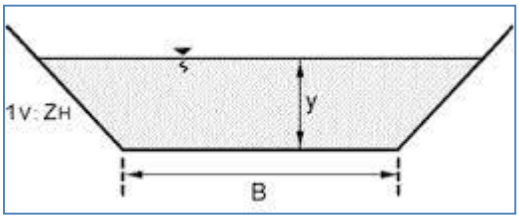
Additional groundwater pumping by surface water or recycled water users would warrant additional groundwater recharge by the District to ensure that groundwater supplies are sustained. The analysis of the additional recharge needed is below.

Analysis

The analysis of additional recharge acreage needed to replenish groundwater if surface water or recycled water were not available in South County is based on 2013 delivery data, which represents the historical maximum. The assumptions used to estimate the groundwater recharge pond area needed for replenishing groundwater supply if surface water or recycled water were not available include the following:

1. The volume of water that needs to be replenished if surface water were not available equals 2013 surface water deliveries, or 2,186 AF per year.
2. The volume of water that needs to be replenished if recycled water were not available equals 2013 recycled water deliveries, or 960 AF per year.
3. All recharge needed can be provided by a single recharge pond.
4. The recharge pond operates 11 months a year, with one month of downtime for pond maintenance.

5. The pond has trapezoidal geometry with 1V:2H side slope and a 20 foot wide perimeter maintenance access road.
6. The recharge pond has the following specifications:
   a. The depth (y) of the recharge pond is 6 feet with 2 feet free board.
   b. The bottom width (B) of the pond is 533 feet.
   c. The top width of the pond (top of bank with a 20 foot wide access road on each side) is 605 feet.
   d. The design infiltration rate (V) is 1 foot/day.
   e. The pond has a side slope of 1V:zH, with z=2.



Using the assumptions above, an additional 8.4 acres of recharge pond area would be needed if surface water deliveries were not available in South County. Similarly, an additional 4.2 acres of recharge pond area would be needed if recycled water was not available. The acreage required would increase if multiple ponds were needed to provide the additional recharge (e.g., if there was no suitable site large enough to accommodate a single pond). This analysis does not evaluate the costs associated with the planning, construction, operation, or maintenance of new recharge facilities.

Conclusions

If surface water or recycled water were not available in South County, those demands would be met through additional groundwater pumping. To sustain groundwater supplies, additional recharge ponds would be needed. This analysis estimates the recharge pond acreage needed to offset additional demands from the lack of surface water or recycled water to be 8.4 acres and 4.2 acres, respectively.

Appendix D: Acronyms

AF – Acre Feet

AG – Agriculture

CVP – Central Valley Project

FY – Fiscal Year

GST – Groundwater, surface water, treated water

GW – Groundwater M&I – Municipal & Industrial

O&M – Operations and maintenance

RW – Recycled water

SW – Surface water

SWP- State Water Project

T – Treatment

T&D – Transmission and distribution

WACC – Weighted average cost of capital

WTP – Water treatment plant